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NASI

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Public Comment

to

Federal Register Rules Docket No. FAA-2001-10770; SFAR 92-4

14 CFR Part 121
Flight Compartment Access & Door Designs;

FINAL RULE
(Published Tuesday, March 19, 2002)

Part XI
Department of Transportation
Federal Aviation Administration

Issue 1:

Cockpit Bulkheads Have Not Been Designed and Tested for Rapid Decompression of the Passenger Cabin Due to Passenger Cabin Windowpane Blowouts.

(Ref. Advisory Circular 25.795-1, FLIGHTDECK INTRUSION RESISTANCE; and Advisory Circular 25.795-2, FLIGHTDECK PENETRATION RESISTANCE)

The **specific change** requested is to include a scenario in which aircraft passenger cabin windows are blown out and result in a rapid decompression of the pressurized passenger cabin at altitudes during flight. The scenario to be considered is for one, two, three, four, or five windowpanes in the passenger cabin to be blown out simultaneously, or in rapid sequence. The current SFAR 92-4, dated March 19, 2002, does not include this likely scenario involving the destruction of passenger cabin windows in terrorist efforts to take over a pressurized Transport Category aircraft.

The **justification** for asking that this change be made is that it is unclear historically if the structural bulkhead that separates the passenger cabin from the cockpit of the aircraft was designed and tested for dynamic pressure differential applied loads to the bulkhead structure. The bulkhead and the cockpit access door (including the vent panel on the door which deploys forward) may have been only designed and evaluated for the scenario of the blow out of the forward windshields located in front of the pilots. The blow out of the forward windshields will result in the pressurized cabin venting the pressure from the cabin forward through the cockpit door vent panel, into the cockpit, and finally out through the window openings. The applied differential pressure loads to the cockpit structural bulkhead will load the rear or aft side of the bulkhead to the forward direction. The structural stiffness characteristics of the bulkhead, attachment brackets, clips, fasteners, etc. may have only been analyzed by the aircraft manufacturers for the forward load case.

It may not be known (by analysis and test) what the structural performance of the cockpit bulkhead would be if passenger window(s) were blown out. The applied loads to the bulkhead would be in the opposite direction from what aircraft manufacturers may have analyzed and tested. If the aircraft manufacturers have not analyzed the reverse air flow loading condition, then the FAA must lead the way to have manufacturers develop such design and test data. The reverse flow load condition for the dynamic loads to the bulkhead may also be of functional concern if the manufacturers have assumed that the cockpit access door located on the cockpit bulkhead was much simpler than the new higher standards reinforced security doors being mandated by the DOT/FAA. (A structurally tougher door may not yield or fail in decompression.)

Extreme applied loads to the cockpit bulkhead may "plastically" deform the bulkhead, or even exceed the design limits of the bulkhead. Either of those two failure modes of the bulkhead is unacceptable for the continued safe flight and landing of the aircraft because

circuit breaker panels, electrical wiring, connectors, terminal strips and blocks are installed and attached to the structures of the bulkhead. Deformation or failure of the cockpit bulkhead would then transfer structural loads into the wire harnesses and electrical circuit breaker panels. The stresses placed upon those systems and subcomponents will result in broken wires, electrical short circuits, and electrical voltage and current arcing. Those events will result in loss of function for the systems powered or controlled by those circuits and pose greater hazards and risks to the flight crew than has been deemed safe by the certification basis and compliance of the aircraft to FAA design regulations.

It is also unclear if the cockpit access door design was intended to open about the door hinge line, or remain closed and latched during a decompression event. If the original (non-strengthened) cockpit door was designed to blow open (especially on aircraft without vents or panels in the cockpit door or bulkhead) during a decompression event, then there may be an engineering design requirement to reanalyze the overall stiffness and function of the bulkhead/door combination. NASI is asking the FAA to clarify these points so that designers of new modifications to the door and bulkhead will have an equitable reference for structural and mechanical design efforts that must show compliance to the FAA regulations of 14 CFR Part 25, and other guidance and policies.

Issue 2:

Perimeter Gaps Between the Cockpit Bulkhead and Aircraft Fuselage May Not Provide Adequate Venting to Control Rapid Decompression Structural Loading Affects on Cockpit Bulkhead

(Ref. Advisory Circular 25.795-1, FLIGHTDECK INTRUSION RESISTANCE; and Advisory Circular 25.795-2, FLIGHTDECK PENETRATION RESISTANCE)

The **specific change** requested is for the FAA to revise the SFAR 92-4, and the Advisory Circular 25.795-1, FLIGHT DECK INTRUSION RESISTANCE, to address known conformity and service difficulties with ventilation obstructions caused by duct tape, aircraft insulation, improperly routed wires and wire harnesses, and cosmetic interior trim the gap around the cockpit bulkhead. Those obstructions will cause resistance to the passenger cabin air that would be forced through the bulkhead/fuselage gap in the event of a rapid decompression from either a cockpit forward windshield or a passenger cabin windowpane blowout.

The **justification** for asking that this change be made is that during Type Certification and Supplemental Type Certification of the Transport Category aircraft, the aircraft manufacturers were required to show compliance to FAA regulations applicable to preventing smoke from migrating into the cockpit from the passenger cabin. Firstly, the functional and design method employed to prevent smoke from migrating into the cockpit is

by use of a slightly higher pressure in the cockpit as compared to the passenger cabin. Secondly, durable adhesive tapes have been allowed by the FAA to help seal the leak paths around the cockpit bulkhead to control smoke penetration and migration.

The tape quantity and location is not regulated or controlled by drawings or maintenance requirements, therefore, the degree of potential obstruction to the bulkhead/fuselage gap is an unknown to the engineering calculations necessary to model, analyze, or test the air mass flow rates **(m-dot=ρAV)** through the gap {Where ρ is density, A is area of venting, and V is velocity of the cabin air}. Tape, foreign objects and debris (FOD), insulation blankets, interior trim panels improperly designed or installed can dramatically reduce the cross-sectional area of the gap and thus greatly REDUCE the **"m-dot"**, or mass flow rate, past the bulkhead, and INCREASE the applied dynamic pressure loads to the cockpit structural bulkhead because the pressure will not relieve quickly. This reduced venting condition can result in applied loads to the cockpit bulkhead that may exceed the design limits of the bulkhead structures and attachment structures to the aircraft fuselage and floor structures.

It is requested that the Advisory Circular 25.795-1, and the SFAR 92-4 be revised to require an FAA conformity inspection of the gaps between the cockpit bulkhead and the fuselage to ensure that there are no restrictions to the airflow that is required to flow through the gap during rapid decompression scenarios. FAA employees of the Manufacturing Inspection District Offices (MIDO's), or MIDO-approved designees, should conduct the FAA conformity inspections of the bulkhead gaps. Any discrepancies, observation, or non-conformities to the FAA-approved Type Design Data should be resolved.

Issue 3:
Dynamic Impact Load Testing Requirements for Strengthened Cockpit Doors Is Incomplete

(Ref. Advisory Circular 25.795-1, FLIGHTDECK INTRUSION RESISTANCE; and Advisory Circular 25.795-2, FLIGHTDECK PENETRATION RESISTANCE)

The **specific change** requested is that the strengthened cockpit access door be dynamically load tested to include load impact spots near the four corners of the door structural panels.

The **justification** for asking that this change be made is that the load application spots called for in the FAA Advisory Circular 25.795-1 do not evaluate the portions of the door panel that are less supported by the door hinges, door bolt/jamb mechanisms. It should be shown by test that the "2 blows of 300 Joules (221.3 ft-lbf)" of impact energy is not capable of deflecting the cockpit door panel to allow an unauthorized person to breach the security of the door panel. The load application spots on the cockpit door panel should include spots at the greatest distance from the hinges and door bolt/jamb mechanisms. For example, the upper corner and the lower corner, on the opposite edge of the door panel from the hinges.

By applying the test load at those spots, the moment arm is greatest and the stiffness of the door panel is weakest. The bending moment generated by applying the test load to the door corner will produce the greatest deflection of the door. That door deflection is a potential breech of the security of the cockpit door. The old saying applies, "If they can find a crack in the door, they can take everything inside the house!" The combination of the critical test load and the critical door structural weakness is the worst-case scenario for such door performance testing.

Issue 4:
Pulling Resistance Test Parameter (ref. AC25.795-1, page 6, Table 1, *Pulling Test Requirement)

(Ref. Advisory Circular 25.795-1, FLIGHTDECK INTRUSION RESISTANCE; and Advisory Circular 25.795-2, FLIGHTDECK PENETRATION RESISTANCE)

The **specific change** requested is to provide more specific guidance in Advisory Circular 25.795-1 FLIGHT DECK INTRUSION RESISTANCE, regarding the applicability to aircraft cockpit access doors and bulkheads of the 250 lbf. load test criteria. The Advisory Circular states that the FAA is relying upon National Institute of Law Enforcement and Criminal Justice (NILECJ) Standard 0306.00, released in May 1976, for Physical Security of Door Assemblies and Components, as formulated by the Law Enforcement Standards Laboratory of the National Bureau of Standards under the sponsorship of the National Institute of Justice (NIJ). As the Advisory Circular states, "That standard is primarily concerned with typical entry doors for residences and small businesses." The Advisory Circular states, "...the standard does not address persons using skilled methods of entry..." The FAA's presentation, argument, and position for using 26 year old home security standards for solving complex aircraft security problems that in reality definitely include "persons with skilled methods of entry" (i.e. trained Terrorists) has not been shown to be applicable and rigorous to ensure that all reasonable issues of security for the flight crew members, the passengers, and the public at large have been solved regarding forced entry by unauthorized people into the aircraft cockpit.

The **justification** for asking that these changes be made are:
There are 2 issues regarding the requirements of Test Method 6.d.4, Table 1, *Pulling Test.

1. The "tensile load of up to 250 lbs., or until the handle no longer supports load" is intended to prevent an "unauthorized person from gaining access to the cockpit". AC 25.795-1 states on page 5, item d(2), "However, while the standard does not address persons using skilled methods of entry, it does address the capability to frustrate determined persons from committing forced entry. To this end, portions of this standard and its test methods are applicable to this requirement." Although it is critical to "frustrate determined persons from committing forced entry", there is at least one scenario that will allow an "unauthorized person" to breach the security of the cockpit door with the new door and bulkhead requirements in place. That scenario is one in which a person breaks out one or more passenger cabin window panes to create a rapid decompression of the aircraft with an instantaneous rush of cabin air to the REAR of the aircraft to produce reverse structural loading onto the cockpit bulkhead and cockpit access door. This reverse loading condition can easily load the cockpit access door to loads much greater than 250 lbf., thereby loading the strengthened doors to applied loads not tested for functionality, security integrity, and compliance to the applicable FAA regulations for the long-term required design

changes to the cockpit door to provide the higher level of security and safety for the flight crew members and the public.

2. The *Pulling Test, Method 6.d.4, allows for "Doors that do not open in a conventional manner, that is, do not swing on hinges, such as pocket doors, should have the pulling force applied with respect to the opening direction of the door. In this case, the pocket door would require loading in a transverse direction. Such procedures should be agreed to with the Administrator." It is NOT clear if the applied load for this type of test will be 250 lbf. (as is required for the standard door testing). The FAA should clarify this point. Additionally, it is doubtful that an equitable certification process is obtainable for the "non-conventional" cockpit doors unless the FAA provides more specific guidance to show test criteria for non-conventional doors. The criteria should include, but not necessarily be limited to, guidance that shows probable loading Free-body Diagrams for "non-conventional cockpit door types", guidance that addresses the Drag Force Loads that are inherent in "pocket door" designs. If the 250 lbf. load is applied to a pocket door, that load is mathematically REDUCED by subtracting the Drag Force Loads of the pocket door mechanisms. Thus, the pocket door test may not evaluate a true applied load of 250 lbf.

Issue 5:

FAA Advisory Circular Currently Allows for "No Testing" Regarding "Non-uniform" Cockpit Door Structures.

(Ref. Advisory Circular 25.795-1, FLIGHTDECK INTRUSION RESISTANCE; and Advisory Circular 25.795-2, FLIGHTDECK PENETRATION RESISTANCE)

The **specific change** requested is to revise the Advisory Circulars 25.795-1 and 25.795-2 to require testing of ALL new strengthened cockpit doors and that the testing should include the Pressure Differential Blowout Vents on the cockpit door, all 4 geometric corners of the cockpit door, and the hinge(s) of the door.

The **justification** for asking that this change be made is that the current SFAR 92-4 allows for "uniform door structures" are not required to be tested to show compliance to the applicable FAA regulations, policies, and guidance. As in Issue 1 through Issue 4 of this Public Comment, the door testing is incomplete and the FAA does have time to complete the design and testing criteria with little impact to the industry.

Final Note to the FAA and the Federal Register:
The issues addressed via this Public Comment from NASI will have minimal economic impact on the airline and aircraft manufacturer mandated testing. Expenses of time and money for the test setup are already a planned expense. The added tasks, such as dropping the calibrated impact weight to strike the door corners, are negligible. The costs from loss of

innocent lives and properties is immeasurable compared to the simpler task of testing the cockpit door, aircraft windows, and bulkheads thoroughly, and with practical reasonableness to provide the highest level of security and safety for the flight crew members and the flying public.

Respectfully,

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President, National Aircraft Services, Inc.

Dated: Wesley M Plattner